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E

mod. IO-CB/AO-08DP-00

User manual

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CANopen I/O Module 8 Ch. ±10V Fast/Enhanced Analogue Outputs
mod. IO-CB/AO-08DP

σ2 SERIES

Through a software command each AO-08DP can be configured to operate in fast or in enhanced mode.
The first part of this manual contains those informations that are module specific, then each configuration will be separately described.
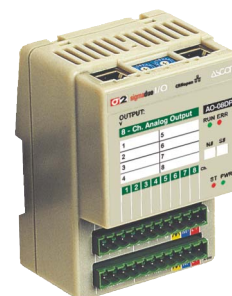
COMMON CHARACTERISTICS

APPLICABLE STANDARDS

The AO-08DP module is suited for the CiA DS301 protocol [1] and implements the CiA DS 401 standard Device Profile, as far as the Analogue Output Function Block is concerned [2].

⚠ **WARNING** ⚠

1) The product described in this manual should only be installed, operated and maintained by qualified application programmers and software engineers who are familiar with automation safety concepts and applicable national standards.
2) This product supports the Parameter defaults indicated by CiA standards, in addition, some parameters have a factory set (value present in the module when comes from the factory). The default values can be loaded with the restore command, but after the restore, factory set values are lost.

Characteristics

Technical data

Accuracy at 25°C	±0.1% FS
Temperature coefficient	0.005% FS/K
Load impedance	V > 600Ω
Digital resolution	16 bit
Output range	±10 V
Conversion time (4 channels)	Fast mode: 5 ms
	Enhanced mode: 20 ms
Overvoltage protection	30 V

General

3 way isolation	800 Vp
Power supply	24 Vdc; −15...+25%
Power consuption	6 W
Dimensions	L: 76; H: 110; W: 65
Weight	220 g
Safety regulations EN61010-1	**Isolation class II** (50 Vrms) Installation cathegory II Pollution degree 2
CE marking	EN61131-2

3 way isolation diagram

Fieldbus	Logic	AO channels 1 - 8
	Power supply	

800Vp
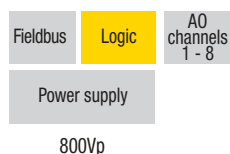
Environment

	Operating	Storage
Temperature	-10...+65°C	-40...+85°C
Relative Humidity	5...95% non condensing Appropriate measures must be taken against humidity >85%	5...95% non condensing For a short period, slight condensation may appear on the housing
Mounting	Vertical, free air	
Protection	IP20	
Vibrations (3 axes)	10...57Hz 0.0375mm 57...150Hz 0.5g	
Shock (3 axes)	15g, 11ms half sine	

Hardware Set-up

Hexadecimal rotary switches, service and I/O LEDs

Top view

Front side

Negative screwdriver 0.4 x 2.5 mm

LED	Status	Meaning
RUN ●	ON	Operational
	Blinking	Pre-operational (CANopen)
	Single flash	STOPPED
	OFF	Device in RESET state
ERR ●	ON	BUS OFF
	Single flash	Warning limit reached
	Double flash	Error Control Event
	Triple flash	Sync Error (CANopen)
	OFF	No error. Device working
ST ●	ON	DIAG Error
	Blinking	INIT and DIAG running
	Single flash	Baud rate setting
	OFF	Module OK and ready
PWR ●	ON	Module Power Supply ON
	OFF	Module Power Supply OFF

Bit Rate and Node ID configuration

Bit rate

Lo switch	Baud rate kbps	Bus length m
1	20	2500
2	50	1000
3	100	500
4	125	500
5	250	250
6 *	500	100
7	800	50
8	1000	25

Node ID

Hi switch	Lo switch	Valid ID Node
0	1	01h (address 1)
0	2	02h (address 2)
↓	↓	↓
7	F	7Fh (address 127D)

Notes: * Default value

Procedure for Node ID and Bit Rate configuration

The HI and LO hexadecimal rotary swithches set the module's Bit Rate and CAN Node ID. During the configuration, the module must be **off line** and the CAN bus must be physically disconnected.
To configure the module, follow the procedure:
1 Turn the Power OFF
2 Set the **HI** switch to "F"
3 Select the desired Bit Rate value by setting the **LO** switch following the table (e.g. "8" for 1 Mbps)
4 Turn the Power ON
5 Shift the **HI** switch to "E" (all the module service LEDs should flash)
6 Turn the Power OFF. Now configure Node ID
7 Set the **HI** and **LO** switches to the desired valid Node ID following the table
8 Turn the Power ON.
Alternatively, at step 7 set the value 00h. Then, at the next Power ON, the last valid stored value will be resumed as Node ID.

Default values: Bit Rate = 500 kbps, Node ID = 127D

AO-08DP FAST/ENHANCED CONFIGURATION

The AO-08DP module comes configured as Fast analogue module. The user can change the module configuration from FAST to ENHANCED modifying the status of an entry of the Object dictionary.

Index 3010h - Fast/Enhanced mode set
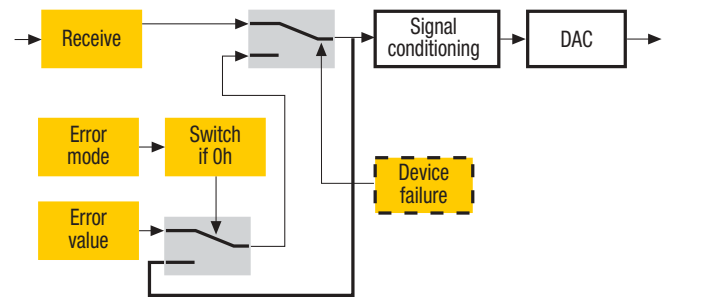
01h: Fast mode (default)

00h: Enhanced mode.

The new mode will be active after a Power OFF-Power ON cycle.

AO-08DP FAST ANALOGUE OUTPUTS CONFIGURATION

When the AO-08DP is configured as Fast analogue module, each output is configured as ±10V

Fast Mode Functional Block Diagram

The analogue output function block describes, for each output channel, how received values are actuated. An "error mode value" is provided as well.

The signal conditioning block only traduces a 16 bit integer into linear physical values, i.e:

- 8000h → min. value (-10V)
- 0000h → half value (0V)
- 7FFFh → max. value (10V)

Commands

Index 200Ch - Analogue Output channel status
The device has its own internal state machine. It is possible to move through this by sending appropriate values to the Index 200Ch, following the table below.

Transition	Operating mode value	Behaviour
Init	-	At Power-Up, the Device is in the "ready" state. Transition 1 is also executed if Index 200Ch – Analog Output channel status contains the default value 1
1	01h	Operating mode "RUN" is activated. To make running the selected channel send **01h** to the corresponding subindex of object 200Ch
2	00h	Return to the initialisation "Ready" state. The transition is performed: • following an operator's command
3	FFh	The "Error" state is automatically assigned by the device (and the operating mode value is "Read Only") when: • an attempt is made to execute an unexpected command
4	00h	This value causes an exit from the "Error" state, after the error condition is acknowledged. The only transition is to the "Ready" state
-	A0h	Reserved

PDOs used by the module

RPDO	Properties	Mapped objects	Index	Sub-index
RPDO 2	COBID: 300h + NodeID Transmission Type: 01h *	Write Output 16-bit ch 1	6411h	01h
		Write Output 16-bit ch 2	6411h	02h
		Write Output 16-bit ch 3	6411h	03h
		Write Output 16-bit ch 4	6411h	04h
RPDO 3	COBID: 400h + NodeID Transmission Type:01h *	Write Output 16-bit ch 5	6411h	05h
		Write Output 16-bit ch 6	6411h	06h
		Write Output 16-bit ch 7	6411h	07h
		Write Output 16-bit ch 8	6411h	08h

Note: * The Transmission Type is configurable: **01h** is the factory set (value present in the modules when come from the factory); **FFh** is the default value

Parameter configuration

Module specific parametres

Index 3000h – Node Address
Current Module Node ID - Read only access

Index 3001h – Baudrate
Current Module Bit rate - Read only access

Standard parameters

Index 6411h - Write Analogue Output 16-Bit
This object shall write an Integer16 value to the output channel 'n'. The value shall be always left adjusted.

Index 6443h - Analogue Output Error Mode
This object defines, whether an output is set to a pre-defined error value (see 6444h object) in case of an internal device failure or a 'Stop remote node' indication.

0h = actual value rest,

1h = reverts to error value integer (6444h),
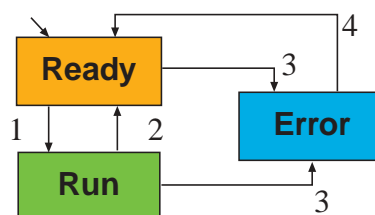**others** = reserved.

Index 6444h - Analogue Output Error Value Integer
On condition that the corresponding Error Mode is active, device failures shall set the outputs to the value configured by this object.

Emergency messages

The module automatically sends emergency messages including error codes. The communication errors are descried in CiA DS301 [1]. The error codes are expressed as a DEVICE SPECIFIC ERROR type of code, one for each channel: 0xFF0n for channel n. The codes indicating a specific condition are also inserted, following the table below:

Error code	Error
0000000000	**No error** - This code is generated when exiting an error contidion, to notify the end of one of the error states
0000000006	**Error No Command** – Invalid command received
0000000007	**Error Wrong Command** – An attempt to execute a command from an illegal state
0000000008	**Error Wrong Assignment** – An attempt to assign a parameter from an illegal state

	0	1	2	3	4	5	6	7
Emergency message	0nh	FFh	21h	00h	00h	00h	00h	0yh
	COB – ID = [entry 1014h] + NodeID							

Error code (spanning columns 3-7)

Parameter Store/Restore

This module allows parameters to be saved in a non volatile memory. In order to avoid storing parameters by mistake, storage is only executed when a specific signature is written to the appropriate subindex. The signature is "save".

Similarly, the default values of parameters, according to the communication or device profile, are restored. On receipt of the correct signature in the appropriate subindex, the device restores the default parameters and then confirms the SDO transmission. The signature is "load".

The new configuration becomes active after a reset, i.e. after a "Power Down" or an NMT "Reset Node" message.

Byte	0	1	2	3	4	5	6	7
Store Parameter	22h	10h	10h	01h	73h	61h	76h	65h
					s	a	v	e
	COB – ID = 600h + NodeID							
Restore Parameter	22h	11h	10h	01h	6Ch	6Fh	61h	64h
					l	o	a	d
	COB – ID = 600h + NodeID							

SDO Messages

The entries of a device Object Dictionary are accessed trough SDO (Service Data Object) messages. The basic SDO messages are as follows, as based on the Client – Server request and response model:

Byte	0	1	2	3	4	5	6	7
Read request	40h	Index		Sub-Index	Reserved			
	COB – ID = 600h + NodeID							
Read response	4xh *	Index		Sub-Index	Data			
	COB – ID = 580h + NodeID							
Write request	22h	Index		Sub-Index	Data			
	COB – ID = 600h + NodeID							
Write response	60h	Index		Sub-Index	Reserved			
	COB – ID = 580h + NodeID							

*   This code is type dependant.
    Please refer to the CIA DS301 Profile for more details.

Object Dictionary (with default values)

⚠ In order to configure the module, it is necessary to connect it to a PC with the CAN interface and the supervisory software installed. The configuration can be obtained by writing the desired values to the module's variables listed in the Object Dictionary.

Object Dictionary structure

Index (hex)	Sub Index	Object	Name	Default [hex]	Type	Acc. Attr.	MO
1000		VAR	Device Type	00080191	UNSIGNED32	RO	M
1001		VAR	Error Register	00	UNSIGNED8	RO	M
1003		ARRAY	Predefined error field	00000000	UNSIGNED32	RO	O
1005		VAR	COB-ID SYNC	00000080	UNSIGNED32	RW	O
1006		VAR	Communication cycle period	00000000	UNSIGNED32	RW	O
1007		VAR	Synchronous window length	00000000	UNSIGNED32	RW	O
1008		VAR	Manufacturer Device Name	"08DP"	Vis-String	const	O
1009		VAR	Manufacturer Hardware Version	"1.00"	Vis-String	const	O
100A		VAR	Manufacturer Software Version	"1.00"	Vis-String	const	O
100C		VAR	Guard Time	0000	UNSIGNED16	RW	O
100D		VAR	Life Time Factor	00	UNSIGNED8	RW	O
1010		ARRAY	Store Parameters		UNSIGNED32		O
	00h	VAR	Largest subindex supported	01	UNSIGNED8	RO	
	01h	VAR	Save all parameters	03	UNSIGNED32	RW	
1011		ARRAY	Restore Default Parameters		UNSIGNED32	RW	O
	00h	VAR	Largest subindex supported	01	UNSIGNED8	RO	
	01h	VAR	Restore all default parameters	01	UNSIGNED32	RW	
1014		VAR	COB-ID EMCY	80+NodeID	UNSIGNED32	RW	O
1015		VAR	Inhibit Time EMCY	0000	UNSIGNED16	RW	O
1017		VAR	Producer heartbeat time	07D0	UNSIGNED16	RW	O
1018		RECORD	Identity Object		Identity (23h)		M
	00h	VAR	Number of entries	01	UNSIGNED8	RO	
	01h	VAR	Vendor ID	000000E9	UNSIGNED32	RO	
1401		RECORD	2nd Receive PDO Comm Param.		PDO CommPar (20h)		M
	00h	VAR	Largest subindex supported	05	UNSIGNED8	RO	
	01h	VAR	COB-ID used	300+NodeID	UNSIGNED32	RW	
	02h	VAR	Transmission type	FF *	UNSIGNED8	RW	
	03h	VAR	Inhibit time	0000	UNSIGNED16	RW	
	04h	VAR	Reseved		UNSIGNED8	RW	
	05h	VAR	Event timer	0000	UNSIGNED16	RW	
1402		RECORD	3rd Receive PDO Comm Param.		PDO CommPar (20h)		M
	00h	VAR	Largest subindex supported	05	UNSIGNED8	RO	
	01h	VAR	COB-ID used	400+NodeID	UNSIGNED32	RW	
	02h	VAR	Transmission type	FF *	UNSIGNED8	RW	
	03h	VAR	Inhibit time	0000	UNSIGNED16	RW	
	04h	VAR	Reseved		UNSIGNED8	RW	
	05h	VAR	Event timer	0000	UNSIGNED16	RW	
1601		RECORD	2nd Receive PDO Mapping		PDO Mapping (21h)		M
	00h	VAR	No. of mapped application obj.	04	UNSIGNED8	RO	
	01h	VAR	Write Output 16-bit ch1	64110110	UNSIGNED32	RO	
	02h	VAR	Write Output 16-bit ch2	64110210	UNSIGNED32	RO	
	03h	VAR	Write Output 16-bit ch3	64110310	UNSIGNED32	RO	
	04h	VAR	Write Output 16-bit ch4	64110410	UNSIGNED32	RO	
1602		RECORD	3rd Receive PDO Mapping		PDO Mapping (21h)		M
	00h	VAR	No. of mapped application obj.	04	UNSIGNED8	RO	
	01h	VAR	Write Output 16-bit ch5	64110510	UNSIGNED32	RO	
	02h	VAR	Write Output 16-bit ch6	64110610	UNSIGNED32	RO	
	03h	VAR	Write Output 16-bit ch7	64110710	UNSIGNED32	RO	
	04h	VAR	Write Output 16-bit ch8	64110810	UNSIGNED32	RO	

Index (hex)	Sub Index	Object	Name	Default [hex]	Type	Acc. Attr.	MO
200C		ARRAY	Analog Output channel status		UNSIGNED8		O
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output channel status Ch1	01	UNSIGNED8	RW	
	02h	VAR	Analog Output channel status Ch2	01	UNSIGNED8	RW	
	03h	VAR	Analog Output channel status Ch3	01	UNSIGNED8	RW	
	04h	VAR	Analog Output channel status Ch4	01	UNSIGNED8	RW	
	05h	VAR	Analog Output channel status Ch5	01	UNSIGNED8	RW	
	06h	VAR	Analog Output channel status Ch6	01	UNSIGNED8	RW	
	07h	VAR	Analog Output channel status Ch7	01	UNSIGNED8	RW	
	08h	VAR	Analog Output channel status Ch8	01	UNSIGNED8	RW	
2010		ARRAY	Analog Output channel type		UNSIGNED8		O
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output channel type Ch1	00	UNSIGNED8	RW	
	02h	VAR	Analog Output channel type Ch2	00	UNSIGNED8	RW	
	03h	VAR	Analog Output channel type Ch3	00	UNSIGNED8	RW	
	04h	VAR	Analog Output channel type Ch4	00	UNSIGNED8	RW	
	05h	VAR	Analog Output channel type Ch5	00	UNSIGNED8	RW	
	06h	VAR	Analog Output channel type Ch6	00	UNSIGNED8	RW	
	07h	VAR	Analog Output channel type Ch7	00	UNSIGNED8	RW	
	08h	VAR	Analog Output channel type Ch8	00	UNSIGNED8	RW	
3000		VAR	Node Address	7F	UNSIGNED8	RO	O
3001		VAR	Node Baurate	06	UNSIGNED8	RO	O
3010		VAR	Fast/Enhanced mode	01	UNSIGNED8	RW	O
6411		ARRAY	Analog Output 16_bit		INTEGER16		O
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output 16_bit Ch1	0	INTEGER16	RW	
	02h	VAR	Analog Output 16_bit Ch2	0	INTEGER16	RW	
	03h	VAR	Analog Output 16_bit Ch3	0	INTEGER16	RW	
	04h	VAR	Analog Output 16_bit Ch4	0	INTEGER16	RW	
	05h	VAR	Analog Output 16_bit Ch5	0	INTEGER16	RW	
	06h	VAR	Analog Output 16_bit Ch6	0	INTEGER16	RW	
	07h	VAR	Analog Output 16_bit Ch7	0	INTEGER16	RW	
	08h	VAR	Analog Output 16_bit Ch8	0	INTEGER16	RW	
6443		ARRAY	Analog Output error mode		UNSIGNED8		O
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output error mode Ch1	01	UNSIGNED8	RW	
	02h	VAR	Analog Output error mode Ch2	01	UNSIGNED8	RW	
	03h	VAR	Analog Output error mode Ch3	01	UNSIGNED8	RW	
	04h	VAR	Analog Output error mode Ch4	01	UNSIGNED8	RW	
	05h	VAR	Analog Output error mode Ch5	01	UNSIGNED8	RW	
	06h	VAR	Analog Output error mode Ch6	01	UNSIGNED8	RW	
	07h	VAR	Analog Output error mode Ch7	01	UNSIGNED8	RW	
	08h	VAR	Analog Output error mode Ch8	01	UNSIGNED8	RW	
6444		ARRAY	Analog Error Output 32_bit		INTEGER32		O
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Error Output 32_bit Ch1	0	INTEGER32	RW	
	02h	VAR	Analog Error Output 32_bit Ch2	0	INTEGER32	RW	
	03h	VAR	Analog Error Output 32_bit Ch3	0	INTEGER32	RW	
	04h	VAR	Analog Error Output 32_bit Ch4	0	INTEGER32	RW	
	05h	VAR	Analog Error Output 32_bit Ch5	0	INTEGER32	RW	
	06h	VAR	Analog Error Output 32_bit Ch6	0	INTEGER32	RW	
	07h	VAR	Analog Error Output 32_bit Ch7	0	INTEGER32	RW	
	08h	VAR	Analog Error Output 32_bit Ch8	0	INTEGER32	RW	

Notes: *]   The factory set (value present in the modules when new) for the transmission type is: **01h**.
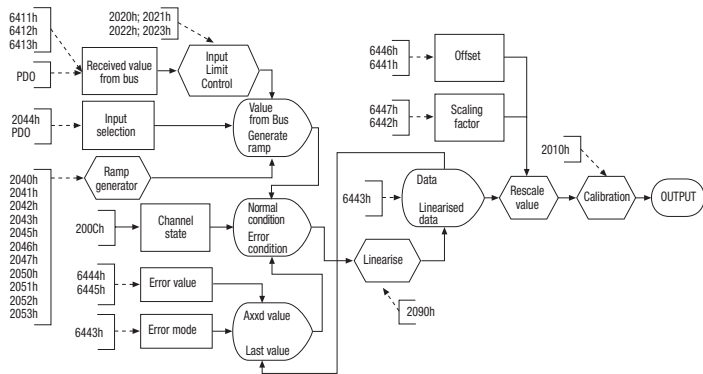
AO-08DP ENHANCED ANALOGUE OUTPUTS CONFIGURATION

When the AO-08DP is configured as Enhanced analogue module (**Index 3010h set to 00h: Enhanced mode; see page 2)**, each output can be configured as ±10V.

The enhanced configuration enables the use of two special functions:
• Ramp and Saw Tooth generation
• Linearisation tables

Enhanced Mode Functional Block Diagram

The analogue output function block describes, for each output channel, how received values are converted into field values. An "error mode value" is provided as well. The signal conditioning blocks perform the linearisation and scaling operations on the received values.

PDOs used by the module

TPDO	Properties	Mapped objects	Index	Sub-index
TPDO 1 [2]	COBID: 180h + NodeID Transmission Type: 01h [1]	Copy of 2044h: Ramp Start Stop Ch 1	2200h	01h
		Copy of 2044h: Ramp Start Stop Ch 2	2200h	02h
		Copy of 2044h: Ramp Start Stop Ch 3	2200h	03h
		Copy of 2044h: Ramp Start Stop Ch 4	2200h	04h
		Copy of 2044h: Ramp Start Stop Ch 5	2200h	05h
		Copy of 2044h: Ramp Start Stop Ch 6	2200h	06h
		Copy of 2044h: Ramp Start Stop Ch 7	2200h	07h
		Copy of 2044h: Ramp Start Stop Ch 8	2200h	08h

Notes: 1] The Transmission Type is configurable:
    01h is the factory set (value present in the modules when come from the factory);
    FFh is the default value
    2] Useful to be advised of an end of ramp (with the appropriate transmission type).

RPDO	Properties	Mapped objects	Index	Sub-index
RPDO 1	COBID: 200h + NodeID Transmission Type: 01h [1]	Ramp Start Stop Ch 1	2440h	01h
		Ramp Start Stop Ch 2	2440h	02h
		Ramp Start Stop Ch 3	2440h	03h
		Ramp Start Stop Ch 4	2440h	04h
		Ramp Start Stop Ch 5	2440h	05h
		Ramp Start Stop Ch 6	2440h	06h
		Ramp Start Stop Ch 7	2440h	07h
		Ramp Start Stop Ch 8	2440h	08h
RPDO 2	COBID: 300h + NodeID Transmission Type: 01h [1]	Write Output 16-bit ch 1	6411h	01h
		Write Output 16-bit ch 2	6411h	02h
		Write Output 16-bit ch 3	6411h	03h
		Write Output 16-bit ch 4	6411h	04h
RPDO 3	COBID: 400h + NodeID Transmission Type: 01h [1]	Write Output 16-bit ch 5	6411h	05h
		Write Output 16-bit ch 6	6411h	06h
		Write Output 16-bit ch 7	6411h	07h
		Write Output 16-bit ch 8	6411h	08h

Notes: 1] The Transmission Type is configurable:
    01h is the factory set (value present in the modules when come from the factory);
    FFh is the default value.

Parameter configuration

Module specific parametres

Index 3000h – Node Address
Current Module Node ID - Read only access
Index 3001h – Baudrate
Current Module Bit rate - Read only access

Parameters setting

Index 2010h - Analogue Output Type
The n-th subindex (from 1 to 8) contains the configuration parameter of the n-th Analogue Output

Value	Output type	Condition
0x00	0...10 V	Default (fixed)

Standard parameters

Index 6411h - Write Analogue Output 16-Bit
This object shall write an Integer16 value to the output channel 'n'. The value shall be always left adjusted.
Index 6412h - Write Analogue Output 32-Bit
This object shall write an Integer32 value to the output channel 'n'. The value shall be always left adjusted.
Index 6413h - Write Analogue Output Float
This object shall write the Integer value to the output channel 'n'.
Integer value = (Float value – Output offset)/Output scale

Index 6441h - Analogue Output Offset Float
This object shall set the offset in Float format for output data (Object 6413h).
Index 6442h - Analogue Output Scaling Float
This object shall set the scaling in Float format for output data (Object 6413h).
Index 6446h - Analogue Output Offset Integer
This object shall set the offset in Integer format for output data (Object 6413h).
Index 6447h - Analogue Output Scaling Integer
This object shall set the scaling in Integer format for output data (Object 6413h).
Index 6443h - Analogue Output Error Mode
This object defines, whether an output is set to a pre-defined error value (see 6444h object) in case of an internal device failure or a 'Stop remote node' indication.
0h = actual value rest; **1h** = reverts to error value integer (6444h); **others** = reserved
Index 6444h - Analogue Output Error Value Integer
On condition that the corresponding Error Mode is active, device failures shall set the outputs to the value configured by this object.
Index 6445h - Analogue Output Error Value Float
On condition that the corresponding Error Mode is active, device failures shall set the outputs to the value configured by this object.
Note: In error mode (or STOPPED NMT state), the outputs behave according to the entries 6443h, 6444h, 6445h, as above mentioned.

Special Function Parameters

In addition to the expected functions, the module provides a number of proprietary output function options.
• **Output Cutoff**
  Set of the limit values for the outputs. Not valid for the ramp generation function. In the case of out-of-limit values an error state is entered.
  Object 2020h - Analog Output high limit float
  Object 2021h - Analog Output low limit float
  Object 2022h - Analog Output high limit integer32
  Object 2023h - Analog Output low limit integer32
• **Ramp generation**
  Each channel can be configured to serve as ramp, saw tooth or triangular wave-form generator. The following objects are used to perform this function:
  Object 2040h - AO Analog Output ramp start value float
  This object defines the starting value of the ramp output in Float format.
  Object 2050h - AO Analog Output ramp start value long
  This object defines the starting value of the ramp output in Integer32 format.

Object 2041h - Analog Output ramp stop value float
This object defines the final value of the ramp output in Float format.
Object 2051h - Analog Output ramp stop value long
This object defines the final value of the ramp output in Integer32 format.
Object 2042h - AO Analog Output ramp slope float
This object defines the slope of the ramp, expressed in digital steps per second (i.e. 0…65535) in Float format.
Object 2052h - AO Analog Output ramp slope long
This object defines the slope of the ramp, expressed in digital steps per second (i.e. 0…65535) in Integer32 format.
Object 2043h - AO Analog Output ramp time value float
This object defines the duration time of the ramp, expressed in seconds, in Float format.
Object 2053h - AO Analog Output ramp time value unsigned long
This object defines the duration time of the ramp, expressed in seconds, in Unsigned32 format.

Object 2044h - AO Analog Output ramp start execute
By this object the ramp start (value = 1) and stop (value = 0) commands are given. In stop condition the output holds the last value. When the ramp ends by slope or by time the object 2044h is automatically reset.
Object 2045h - AO Analog Output continuous ramp execute
This object selects the ramp generation mode:
Value = 0 Single ramp; **Value = 1** Continuous ramp
Object 2046h - AO Analog Output triangular or saw thoot
In the case of continuous ramp, by this object the shape of the ramp is selected:
Value = 0 Triangle; **Value = 1** Saw tooth
Object 2047h - AO Analog Output ramp by slope or by time
This object selects how the ramp duration is computed, using the slope parameter or the time parameter directly: **Value = 0** Time; **Value = 1** Slope
• **Output linearisation option**
The module is able to store up to two linearisation tables, each of which can be assigned to the selected output channel. The objects with the aim of performing this option are as follows:
Object 2060h - Number of used points in linearisation table 1
This object sets the number of linearising points used by the first linearisation table
Object 2061h - X values in table 1 type long
This object contains, one for each subindex, in Integer32 format, the 16 X points of the first XY linearisation table

Object 2062h - X values in table 1 type float
This object contains, one for each subindex, in Float format, the 16 X points of the first XY linearisation table
Object 2063h - Y values in table 1 type long
This object contains, one for each subindex, in Integer32 format, the 16 Y points of the first XY linearisation table
Object 2064h - Y values in table 1 type float
This object contains, one for each subindex, in Float format, the 16 Y points of the first XY linearisation table
Object 2070h - Number of used points in linearisation table 2
This object sets the number of linearising points used by the second linearisation table
Object 2071h - X values in table 2 type long
This object contains, one for each subindex, in Integer32 format, the 16 X points of the second XY linearisation table
Object 2072h - X values in table 2 type float
This object contains, one for each subindex, in Float format, the 16 X points of the second XY linearisation table
Object 2073h - Y values in table 2 type long
This object contains, one for each subindex, in Integer32 format, the 16 Y points of the second XY linearisation table

Object 2074h - Y values in table 2 type float
This object contains, one for each subindex, in Float format, the 16 Y points of the second XY linearisation table
Object 2080h - Linearisation on
By this object, the linearisation option is assigned to each channel, one for each subindex:
Value = 0 Assigned; **Value = 1** Not assigned
Object 2090h - Select linearisation table
By this object, the desired linearisation table is assigned to each channel, one for each subindex:
Value = 0 Assign Table 1; **Value = 1** Assign Table 2

Commands

Index 200Ch - Analogue Output channel status
The device has its own internal state machine. It is possible to move through this by sending appropriate values to the Index 200Ch, following the table below.

Transition	Operating mode value	Behaviour
Init	-	At Power-Up, the Device is in the "ready" state. Transition 1 is also executed if Index 200Ch – Analog Output channel status contains the default value 1
1	01h	Operating mode "RUN" is activated. To make running the selected channel send 01h to the corresponding subindex of object 200Ch
2	00h	Return to the initialisation "ready" state. The transition is performed: • following an operator's command; • after assigning a configuration parameter
3	FFh	The "error" state is automatically assigned by the device (and the operating mode value is "Read Only") when: • an attempt is made to execute an unexpected command
4	00h	This value causes an exit from the "error" state, after the error condition is acknowledged. The only transition is to the "ready" state
5	0Ah	Enter linearisation table set state
6	00h	Exit linearisation table set
-	A0h	Reserved

Emergency messages

The module automatically sends emergency messages including error codes. The communication errors are descrided in CiA DS301 [1]. The error codes are expressed as a DEVICE SPECIFIC ERROR type of code, one for each channel: 0xFF0n for channel n. The codes indicating a specific condition are also inserted, following the table below:

Error code	Error
0000000000	**No error -** This code is generated when exiting an error contidion, to notify the end of one of the error states
0000000006	**Error No Command** – Invalid command received
0000000007	**Error Wrong Command** – An attempt to execute a command from an illegal state
0000000008	**Error Wrong Assignment** – An attempt to assign a parameter from an illegal state
0000000009	**Error Wave Generation** - The parameters calculated for ramp generation are not consistent

	0	1	2	3	4	5	6	7
Emergency message	0nh	FFh	21h	00h	00h	00h	00h	0yh
	COB – ID = [entry 1014h] + NodeID							

Error code

Parameter Store/Restore

This module allows parameters to be saved in a non volatile memory. In order to avoid storing parameters by mistake, storage is only executed when a specific signature is written to the appropriate subindex. The signature is "save".
Similarly, the default values of parameters, according to the communication or device profile, are restored. On receipt of the correct signature in the appropriate subindex, the device restores the default parameters and then confirms the SDO transmission. The signature is "load".
The new configuration becomes active after a reset, i.e. after a "Power Down" or an NMT "Reset Node" message.

Byte	0	1	2	3	4	5	6	7
Store Parameter	22h	10h	10h	01h	73h	61h	76h	65h
					s	a	v	e
	COB – ID = 600h + NodeID							
Restore Parameter	22h	11h	10h	01h	6Ch	6Fh	61h	64h
					l	o	a	d
	COB – ID = 600h + NodeID							

The entries of a device Object Dictionary are accessed trough SDO (Service Data Object) messages. The basic SDO messages are as follows, as based on the Client – Server request and response model:

Byte	0	1	2	3	4	5	6	7
Read request	40h	Index		Sub-Index	Reserved			
	COB – ID = 600h + NodeID							
Read response	4xh *	Index		Sub-Index	Data			
	COB – ID = 580h + NodeID							
Write request	22h	Index		Sub-Index	Data			
	COB – ID = 600h + NodeID							
Write response	60h	Index		Sub-Index	Reserved			
	COB – ID = 580h + NodeID							

* This code is type dependant.
  Please refer to the CIA DS301 Profile for more details.

List of CiA documents to which the user should refer:
[1] CiA DS301 - CANopen Application Layer and Communication Profile
[2] CiA DS401 - CANopen Device Profile for Generic I/O Modules

Power Supply 45W 24Vdc 2A	AP-S2/AL-DR45-24
Power Supply 120W 24Vdc 5A	AP-S2/AL-DR120-24
Additional Terminal Block 2x11	AP-S2/TB-211-1
Female Plug 11 Screw clamp	AP-S2/SPINA-V11
Female Plug 11 Spring clamp	AP-S2/SPINA-M11
RJ45 terminated cable 14cm	AP-S2/LOCAL-BUS76
RJ45 terminated cable 22cm	AP-S2/LOCAL-BUS152
CAN termination Adapter	AP-S2/TERM-CAN

Warranty: 3 years excluding defects due to improper use

⚠ In order to configure the module, it is necessary to connect it to a PC with the CAN interface and the superivisory software installed. The configuration can be obtained by writing the desired values to the module's variables listed in the Object Dictionary.

Object Dictionary structure

Index (hex)	Sub Index	Object	Name	Default [hex]	Type	Acc. Attr.	MO
1000		VAR	Device Type	00080191	UNSIGNED32	RO	M
1001		VAR	Error Register	00	UNSIGNED8	RO	M
1003		ARRAY	Predefined error field	00000000	UNSIGNED32	RO	O
1005		VAR	COB-ID SYNC	00000080	UNSIGNED32	RW	O
1006		VAR	Communication cycle period	00000000	UNSIGNED32	RW	O
1007		VAR	Synchrounous window length	00000000	UNSIGNED32	RW	O
1008		VAR	Manufacturer Device Name	"08DP"	Vis-String	const	O
1009		VAR	Manufacturer Hardware Version	"1.00"	Vis-String	const	O
100A		VAR	Manufacturer Software Version	"1.00"	Vis-String	const	O
100C		VAR	Guard Time	0000	UNSIGNED16	RW	O
100D		VAR	Life Time Factor	00	UNSIGNED8	RW	O
1010		ARRAY	Store Parameters		UNSIGNED32		O
	00h	VAR	Largest subindex supported	01	UNSIGNED8	RO	
	01h	VAR	Save all parameters	03	UNSIGNED32	RW	
1011		ARRAY	Restore Default Parameters		UNSIGNED32	RW	O
	00h	VAR	Largest subindex supported	01	UNSIGNED8	RO	
	01h	VAR	Restore all default Parameters	01	UNSIGNED32	RW	
1014		VAR	COB-ID EMCY	80+NodeID	UNSIGNED32	RW	O
1015		VAR	Inhibit Time EMCY	0000	UNSIGNED16	RW	O
1017		VAR	Producer heartbeat time	07D0	UNSIGNED16	RW	O
1018		RECORD	Identity Object		Identity (23h)		M
	00h	VAR	Number of entries	01	UNSIGNED32	RO	
	01h	VAR	Vendor ID	000000E9	UNSIGNED32	RO	
1400		RECORD	1st Receive PDO Comm Param.		PDO CommPar (20h)		M
	00H	VAR	Largest subindex supported	05	UNSIGNED8	RO	
	01h	VAR	COB-ID used	200+NodeID	UNSIGNED32	RW	
	02h	VAR	Transmission type	FF *	UNSIGNED8	RW	
	03h	VAR	Inhibit time	0000	UNSIGNED16	RW	
	04h	VAR	Reseved		UNSIGNED8	RW	
	05h	VAR	Event timer	0000	UNSIGNED16	RW	
1401		RECORD	2nd Receive PDO Comm Param.		PDO CommPar (20h)		M
	00h	VAR	Largest subindex supported	05	UNSIGNED8	RO	
	01h	VAR	COB-ID used	300+NodeID	UNSIGNED32	RW	
	02h	VAR	Transmission type	FF *	UNSIGNED8	RW	
	03h	VAR	Inhibit time	0000	UNSIGNED16	RW	
	04h	VAR	Reseved		UNSIGNED8	RW	
	05h	VAR	Event timer	0000	UNSIGNED16	RW	
1402		RECORD	3rd Receive PDO Comm Param.		PDO CommPar (20h)		M
	00h	VAR	Largest subindex supported	05	UNSIGNED8	RO	
	01h	VAR	COB-ID used	400+NodeID	UNSIGNED32	RW	
	02h	VAR	Transmission type	FF *	UNSIGNED8	RW	
	03h	VAR	Inhibit time	0000	UNSIGNED16	RW	
	04h	VAR	Reseved		UNSIGNED8	RW	
	05h	VAR	Event timer	0000	UNSIGNED16	RW	
1600		RECORD	1st Receive PDO Mapping		PDO Mapping (21h)		M
	00h	VAR	No. of mapped application obj.	08	UNSIGNED8	RO	
	01h	VAR	Ramp Start Stop Ch1	20440108	UNSIGNED32	RO	
	...	VAR	...	...	UNSIGNED32	RO	
	08h	VAR	Ramp Start Stop Ch8	20440808	UNSIGNED32	RO	
1601		RECORD	2nd Receive PDO Mapping		PDO Mapping (21h)		M
	00h	VAR	No. of mapped application obj.	4	UNSIGNED8	RO	
	01h	VAR	Write Output 16-bit ch1	64110110	UNSIGNED32	RO	
	02h	VAR	Write Output 16-bit ch2	64110210	UNSIGNED32	RO	
	03h	VAR	Write Output 16-bit ch3	64110310	UNSIGNED32	RO	
	04h	VAR	Write Output 16-bit ch4	64110410	UNSIGNED32	RO	
1602		RECORD	3rd Receive PDO Mapping		PDO Mapping (21h)		M
	00h	VAR	No. of mapped application obj.	04	UNSIGNED8	RO	
	01h	VAR	Write Output 16-bit ch5	64110510	UNSIGNED32	RO	
	02h	VAR	Write Output 16-bit ch6	64110610	UNSIGNED32	RO	
	03h	VAR	Write Output 16-bit ch7	64110710	UNSIGNED32	RO	
	04h	VAR	Write Output 16-bit ch8	64110810	UNSIGNED32	RO	
1800		RECORD	1st Transmit PDO Comm Param.		PDO CommPar (20h)		M
	00H	VAR	Largest subindex supported	05	UNSIGNED8	RO	
	01h	VAR	COB-ID used	180+NodeID	UNSIGNED32	RW	
	02h	VAR	Transmission type	FF *	UNSIGNED8	RW	
	03h	VAR	Inhibit time	0000	UNSIGNED16	RW	
	04h	VAR	Reseved		UNSIGNED8	RW	
	05h	VAR	Event timer	0000	UNSIGNED16	RW	

Index (hex)	Sub Index	Object	Name	Default [hex]	Type	Acc. Attr.	MO
1A00		RECORD	1st Transmit PDO Mapping		PDO Mapping (21h)		M
	00h	VAR	No. of mapped application obj	02	UNSIGNED8	RO	
	01h	VAR	Copy of 2044: Ramp Start Stop Ch1	22000108	UNSIGNED32	RO	
	...	VAR	...	...	UNSIGNED32	RO	
	08h	VAR	Copy of 2044: Ramp Start Stop Ch8	22000808	UNSIGNED32	RO	
200C		ARRAY	Analog Output channel status		UNSIGNED8		O
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output channel status Ch1	01	UNSIGNED8	RW	
	...	VAR	...	01	UNSIGNED8	RW	
	08h	VAR	Analog Output channel status Ch8	01	UNSIGNED8	RW	
2010		ARRAY	Analog Output channel type		UNSIGNED8		O
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output channel type Ch1	00	UNSIGNED8	RW	
	...	VAR	...	00	UNSIGNED8	RW	
	08h	VAR	Analog Output channel type Ch8	00	UNSIGNED8	RW	
2020		ARRAY	Analog Output high limit		FLOAT		O
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output high limit Ch1	65535	FLOAT	RW	
	...	VAR	...	65535	FLOAT	RW	
	08h	VAR	Analog Output high limit Ch8	65535	FLOAT	RW	
2021		ARRAY	Analog Output low limit		FLOAT		O
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output low limit Ch1	0	FLOAT	RW	
	...	VAR	...	0	FLOAT	RW	
	08h	VAR	Analog Output low limit Ch8	0	FLOAT	RW	
2022		ARRAY	Analog Output high limit integer 32		INTEGER32		O
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output high limit Ch1	65535	INTEGER32	RW	
	...	VAR	...	65535	INTEGER32	RW	
	08h	VAR	Analog Output high limit Ch8	65535	INTEGER32	RW	
2023		ARRAY	Analog Output low limit integer 32		INTEGER32		O
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output low limit Ch1	0	INTEGER32	RW	
	...	VAR	...	0	INTEGER32	RW	
	08h	VAR	Analog Output low limit Ch8	0	INTEGER32	RW	

Notes: *] The factory set (value present in the modules when new) for the transmission type is: **01h**.

Left column:

Index (hex)	Sub Index	Object	Name	Default [hex]	Type	Acc. Attr.	MO
2040		ARRAY	Analog Output ramp start value float		FLOAT		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output ramp start value Ch1	0	FLOAT	RW	
	…	VAR	…	0	FLOAT	RW	
	08h	VAR	Analog Output ramp start value Ch8	0	FLOAT	RW	
2041		ARRAY	Analog Output ramp stop value float		FLOAT		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output ramp stop value Ch1	0xFFFF	FLOAT	RW	
	…	VAR	…	0xFFFF	FLOAT	RW	
	08h	VAR	Analog Output ramp stop value Ch8	0xFFFF	FLOAT	RW	
2042		ARRAY	Analog Output ramp slope value float		FLOAT		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output ramp slope value Ch1	0xFFFF	FLOAT	RW	
	…	VAR	…	0xFFFF	FLOAT	RW	
	08h	VAR	Analog Output ramp slope value Ch8	0xFFFF	FLOAT	RW	
2043		ARRAY	Analog Output ramp time value float		FLOAT		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output ramp time value Ch1	1	FLOAT	RW	
	…	VAR	…	1	FLOAT	RW	
	08h	VAR	Analog Output ramp time value Ch8	1	FLOAT	RW	
2044		ARRAY	Analog Output ramp start execute		UNSIGNED8		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output ramp start Ch1	0	UNSIGNED8	RW	
	…	VAR	…	0	UNSIGNED8	RW	
	08h	VAR	Analog Output ramp start Ch8	0	UNSIGNED8	RW	
2045		ARRAY	Analog Output continuous ramp exec.		UNSIGNED8		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output continuous ramp Ch1	0	UNSIGNED8	RW	
	…	VAR	…	0	UNSIGNED8	RW	
	08h	VAR	Analog Output continuous ramp Ch8	0	UNSIGNED8	RW	
2046		ARRAY	Analog Output triangular or saw tooth		UNSIGNED8		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Triangular or saw tooth Ch1	0	UNSIGNED8	RW	
	08h	VAR	Triangular or saw tooth Ch8	0	UNSIGNED8	RW	
2047		ARRAY	Analog Output ramp by slope or by time		UNSIGNED8		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	ramp by slope or by time Ch1	0	UNSIGNED8	RW	
	…	VAR	…	0	UNSIGNED8	RW	
	08h	VAR	ramp by slope or by time Ch8	0	UNSIGNED8	RW	
2050		ARRAY	Analog Output ramp start value long		INTEGER32		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output ramp start value Ch1	0	INTEGER32	RW	
	…	VAR	…	0	INTEGER32	RW	
	08h	VAR	Analog Output ramp start value Ch8	0	INTEGER32	RW	
2051		ARRAY	Analog Output ramp stop value long		INTEGER32		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output ramp stop value Ch1	0xFFFF	INTEGER32	RW	
	…	VAR	…	0xFFFF	INTEGER32	RW	
	08h	VAR	Analog Output ramp stop value Ch8	0xFFFF	INTEGER32	RW	
2052		ARRAY	Analog Output ramp slope value integer 32		INTEGER32		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output ramp slope value Ch1	0xFFFF	INTEGER32	RW	
	…	VAR	…	0	INTEGER32	RW	
	08h	VAR	Analog Output ramp slope value Ch8	0xFFFF	INTEGER32	RW	
2053		ARRAY	Analog Output ramp time value unsigned long		UNSIGNED32		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output ramp time value Ch1	1	UNSIGNED32	RW	
	…	VAR	…	1	UNSIGNED32	RW	
	08h	VAR	Analog Output ramp time value Ch8	1	UNSIGNED32	RW	
2060		VAR	No. of used points in linearisation table 1	0	UNSIGNED8	RW	0
2061		ARRAY	X values in table 1 type long		INTEGER32		0
	00h	VAR	Number of entries	10	UNSIGNED8	RO	
	01h	VAR	X values in table 1 point 1	0x0	INTEGER32	RW	
	…	VAR	…	0x0	INTEGER32	RW	
	10h	VAR	X values in table 1 point 16	0x0	INTEGER32	RW	
2062		ARRAY	X values in table 1 type float		FLOAT		0
	00h	VAR	Number of entries	10	UNSIGNED8	RO	
	01h	VAR	X values in table 1 point 1	0x0	FLOAT	RW	
	…	VAR	…	0x0	FLOAT	RW	
	10h	VAR	X values in table 1 point 16	0x0	FLOAT	RW	
2063		ARRAY	Y values in table 1 type long		INTEGER32		0
	00h	VAR	Number of entries	10	UNSIGNED8	RO	
	01h	VAR	Y values in table 1 point 1	0x0	INTEGER32	RW	
	…	VAR	…	0x0	INTEGER32	RW	
	10h	VAR	Y values in table 1 point 16	0x0	INTEGER32	RW	
2064		ARRAY	Y values in table 1 type long		FLOAT		0
	00h	VAR	Number of entries	10	UNSIGNED8	RO	
	01h	VAR	Y values in table 1 point 1	0x0	FLOAT	RW	
	…	VAR	…	0x0	FLOAT	RW	
	10h	VAR	Y values in table 1 point 16	0x0	FLOAT	RW	
2070		VAR	No. of used points in linearisation table 2	0	UNSIGNED8	RW	0
2071		ARRAY	X values in table 2 type long		INTEGER32		0
	00h	VAR	Number of entries	10	UNSIGNED8	RO	
	01h	VAR	X values in table 2 point 1	0x0	INTEGER32	RW	
	…	VAR	…	0x0	INTEGER32	RW	
	10h	VAR	X values in table 2 point 16	0x0	INTEGER32	RW	
2072		ARRAY	X values in table 2 type float		FLOAT		0
	00h	VAR	Number of entries	10	UNSIGNED8	RO	
	01h	VAR	X values in table 2 point 1	0x0	FLOAT	RW	
	…	VAR	…	0x0	FLOAT	RW	
	10h	VAR	X values in table 2 point 16	0x0	FLOAT	RW	
2073		ARRAY	Y values in table 2 type long		INTEGER32		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Y values in table 2 point 1	0x0	INTEGER32	RW	
	…	VAR	…	0x0	INTEGER32	RW	
	10h	VAR	Y values in table 2 point 16	0x0	INTEGER32	RW	

Right column:

Index (hex)	Sub Index	Object	Name	Default [hex]	Type	Acc. Attr.	MO
2074		ARRAY	Y values in table 2 type float		FLOAT		0
	00h	VAR	Number of entries	10	UNSIGNED8	RO	
	01h	VAR	Y values in table 2 point 1	0x0	FLOAT	RW	
	…	VAR	…	0x0	FLOAT	RW	
	10h	VAR	Y values in table 2 point 16	0x0	FLOAT	RW	
2080		ARRAY	Analog Output linearisation on		UNSIGNED8		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	linearisation on Ch1	0	UNSIGNED8	RW	
	…	VAR	…	0	UNSIGNED8	RW	
	08h	VAR	linearisation on Ch8	0	UNSIGNED8	RW	
2090		ARRAY	Select linearisation table		UNSIGNED8		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Select linearisation table Ch1	0	UNSIGNED8	RW	
	…	VAR	…	0	UNSIGNED8	RW	
	08h	VAR	Select linearisation table Ch8	0	UNSIGNED8	RW	
2200		ARRAY	Copy of 2044h ramp start stop		UNSIGNED8		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Copy of 2044h ramp start stop Ch1	0	UNSIGNED8	RW	
	…	VAR	….	0	UNSIGNED8	RW	
	08h	VAR	Copy of 2044h ramp start stop Ch8	0	UNSIGNED8	RW	
3000		VAR	Node Address	7F	UNSIGNED8	RO	0
3001		VAR	Node Baurate	06	UNSIGNED8	RO	0
3010		VAR	Fast/Enhanced mode	01	UNSIGNED8	RW	0
6411		ARRAY	Analog Output 16_bit		INTEGER16		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output 16_bit Ch1	0	INTEGER16	RW	
	…	VAR	…	0	INTEGER16	RW	
	08h	VAR	Analog Output 16_bit Ch8	0	INTEGER16	RW	
6412		ARRAY	Analog Output 32_bit		INTEGER32		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output 32_bit Ch1	0	INTEGER32	RW	
	…	VAR	…	0	INTEGER32	RW	
	08h	VAR	Analog Output 32_bit Ch8	0	INTEGER32	RW	
6413		ARRAY	Analog Output float		FLOAT		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output float Ch1	0	FLOAT	RW	
	…	VAR	…	0	FLOAT	RW	
	08h	VAR	Analog Output float Ch8	0	FLOAT	RW	
6441		ARRAY	Analog Output offset float		FLOAT		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output offset float Ch1	0	FLOAT	RW	
	…	VAR	…	0	FLOAT	RW	
	08h	VAR	Analog Output offset float Ch8	0	FLOAT	RW	
6442		ARRAY	Analog Output scaling float		FLOAT		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output scaling float Ch1	1	FLOAT	RW	
	…	VAR	…	1	FLOAT	RW	
	08h	VAR	Analog Output scaling float Ch8	1	FLOAT	RW	
6443		ARRAY	Analog Output error mode		UNSIGNED8		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output error mode Ch1	1	UNSIGNED8	RW	
	…	VAR	…	1	UNSIGNED8	RW	
	08h	VAR	Analog Output error mode Ch8	1	UNSIGNED8	RW	
6444		ARRAY	Analog Error Output 32_bit		INTEGER32		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Error Output 32_bit Ch1	0	INTEGER32	RW	
	…	VAR	…	0	INTEGER32	RW	
	08h	VAR	Analog Error Output 32_bit Ch8	0	INTEGER32	RW	
6445		ARRAY	Analog Error Output float		FLOAT		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Error Output float Ch1	0	FLOAT	RW	
	…	VAR	…	0	FLOAT	RW	
	08h	VAR	Analog Error Output float Ch8	0	FLOAT	RW	
6446		ARRAY	Analog Output Offset 32_bit		INTEGER32		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output Offset 32_bit Ch1	0	INTEGER32	RW	
	…	VAR	…	0	INTEGER32	RW	
	08h	VAR	Analog Output Offset 32_bit Ch8	0	INTEGER32	RW	
6447		ARRAY	Analog Output Scaling 32_bit		INTEGER32		0
	00h	VAR	Number of entries	08	UNSIGNED8	RO	
	01h	VAR	Analog Output Scaling 32_bit Ch1	1	INTEGER32	RW	
	…	VAR	…	1	INTEGER32	RW	
	08h	VAR	Analog Output Scaling 32_bit Ch8	1	INTEGER32	RW	

Notes: *] The factory set (value present in the modules when new) for the transmission type is: **01h**.